IN THE CLAIMS:

Please amend the claims as follows:

1. (Currently Amended) ~~An~~ Ethernet-PON (Passive Optical Network) accommodating real-time broadcast and/or image signals and configured for providing security for the accommodated signals, comprising:

an OLT (Optical Line Terminal) for switching between a plurality of digital broadcast and/or digital image data received from an external broadcast provider, according to respective broadcast and/or image selection information of users received from the users, scrambling the switched digital data on a user-by-user basis, multiplexing the scrambled digital data into a single signal, electro-optically converting the multiplexed signal, electro-optically converting communication data received through an IP (Internet Protocol) network, coupling the converted digital and communication data, and transmitting the coupled signal;

a plurality of ONTs (Optical Network Terminals), each ONT receiving from the OLT an optical signal, separating the received optical signal into said converted digital and communication data, photoelectrically converting the separated data, selecting broadcast and/or image data from the photoelectrically converted digital data according to the corresponding broadcast and/or image selection information, descrambling the selected broadcast and/or image data on a user-by-user basis to produce an output signal, outputting the separated, converted communication data and said output signal to a corresponding user, receiving an upstream communication signal and said broadcast and/or image selection information from the user, and outputting to the OLT said upstream communication signal and said broadcast and/or image selection information

through the path for upstream transmitting said communication signal; and

an optical splitter for splitting a signal from the OLT among the plural ONTs,

coupling signals from the plural ONTs to create a combined signal, and transmitting to

the OLT said combined signal.

2. (Original) The Ethernet-PON according to claim 1, wherein the OLT receives

digital broadcast data and digital image data, and wherein each of the plurality of ONTs

includes:

a wavelength division multiplexing (WDM) coupler for separating an optical

signal received from the OLT into a communication signal of wavelength λ_{DOWN} and a

broadcast/image signal of wavelength λ_B;

an optical receiver for receiving the separated communication signal of

wavelength λ_{DOWN}, and converting the received signal of wavelength λ_{DOWN} into an

electrical signal;

another optical receiver for receiving the separated broadcast/image signal of λ_B,

and converting it into an electrical signal;

an Ethernet-PON ONT function processor for performing ONT functions;

another optical transmitter for receiving broadcast/image selection information

and a communication signal to be transmitted to the OLT from a corresponding user

through the Ethernet-PON ONT function processor, and transmitting said

broadcast/image information and a communication signal as an optical signal λ_{UP};

a broadcast/image channel selector & broadcast/image adapter for selecting a

broadcast/image signal according to the broadcast/image selection information selected

3

by the user, and recovering an associated original broadcast/image channel;

a descrambler for descrambling the broadcast/image signal recovered through the

channel selector & broadcast/image adapter, and transferring the descrambled, recovered

signal to the user; and

a descrambler controller for controlling the descrambler to perform the

descrambling operation by transferring the scrambling information corresponding to the

ONT from the Ethernet-PON ONT function processor to the descrambler.

3. (Original) The Ethernet-PON according to claim 2, wherein specific functions

and initial states are assigned to the ONTs, respectively, to allow the respective

scramblers and descramblers to perform the scrambling and descrambling operations.

4. (Original) The Ethernet-PON according to claim 3, wherein the scrambler for

performing the scrambling operation based on the specific function and initial state

includes:

a shift register for storing the initial state and performing a shift operation by the

subsequent logical operations;

a first exclusive-OR gate for performing an exclusive-OR operation between

element values of the shift register, and outputting the resulting value to an input of the

shift register;

an AND gate for performing an AND operation between an output of the first

exclusive-OR gate and an external enable signal; and

4

a second exclusive-OR gate for performing an exclusive-OR operation between

input data and an output of the AND gate, and outputting the resulting value.

5. (Original) The Ethernet-PON according to claim 4, wherein the specific

function is expressed by the following equation:

$$p(x) = c_n X^n + c_{n-1} X^{n-1} + \ldots + c_2 X^2 + c_1 X^1 + 1,$$

where c_i is a constant of '0' or '1', x^i denotes the value of an i-th element of the

shift register, and the constant c is set to '1' for elements of the shift register connected to

the first exclusive-OR gate, and to '0' for the other elements of the shift register.

6. (Original) The Ethernet-PON according to claim 1, wherein the OLT includes:

a broadcast/image channel selection switch for receiving external MPEG (Motion

Picture Experts Group) broadcast and image data, and switching and outputting said

broadcast and image data on a user-by-user basis;

a plurality of scramblers for scrambling broadcast/image channels outputted from

the broadcast/image channel selection switch on a user-by-user basis;

a multiplexer for receiving the scrambled broadcast/image signals from the plural

scramblers, and combining them into a single broadcast/image signal;

a first optical transmitter for optically modulating said single broadcast/image

signal;

an Ethernet-PON OLT function processor for performing Ethernet-PON OLT

functions;

a scrambler controller for controlling the plural scramblers according to respective

5

broadcast/image selection information of the users from the Ethernet-PON OLT function

processor;

an IP router for routing communication data to an upper level IP network or to the

Ethernet-PON OLT function processor;

a second optical transmitter for optically modulating communication data to be

transmitted to the plural ONTs;

a first optical receiver for receiving an optical signal from the plural ONTs, and

converting into an electrical signal, and then transferring to the Ethernet-PON OLT

function processor after its conversion, said optical signal from the plural ONTs that has

been received;

a broadcast/image channel selection controller for receiving the broadcast/image

selection information from the plural ONTs through the Ethernet-PON OLT function

processor, and outputting a control signal to the broadcast/image channel selection switch

so as to allow the switch to select broadcast/image channels corresponding respectively to

the plural ONTs; and

a first wavelength division multiplexing (WDM) coupler for coupling an optically

modulated communication signal of wavelength λ_{DOWN} and an optically modulated

broadcast/image signal of wavelength λ_B, and outputting the resulting signal.

7. (Original) The Ethernet-PON according to claim 6, wherein each of the

plurality of ONTs includes:

a second WDM coupler for separating an optical signal received from the OLT

into a communication signal of wavelength λ_{DOWN} and a broadcast/image signal of

6

wavelength λ_B;

a second optical receiver for receiving the separated communication signal of wavelength λ_{DOWN}, and converting the signal of wavelength λ_{DOWN} into an electrical signal;

a third optical receiver for receiving the separated broadcast/image signal of wavelength λ_B, and converting into an electrical signal the received signal of wavelength λ_B;

an Ethernet-PON ONT function processor for performing ONT functions;

a third optical transmitter for receiving broadcast/image selection information and a communication signal to be transmitted to the OLT from a corresponding user through the Ethernet-PON ONT function processor, and transmitting said broadcast/image selection information and a communication signal as an optical signal λ_{UP};

a broadcast/image channel selector & broadcast/image adapter for selecting a broadcast/image signal according to the broadcast/image selection information selected by the user, and recovering an associated original broadcast/image channel;

a descrambler for descrambling the broadcast/image signal recovered through the channel selector & broadcast/image adapter, and transferring the descrambled, recovered signal to the user; and

a descrambler controller for controlling the descrambler to perform the descrambling operation by transferring the scrambling information corresponding to the ONT from the Ethernet-PON ONT function processor to the descrambler.

7

8. (Original) The Ethernet-PON according to claim 7, wherein specific functions and initial states are assigned to the ONTs, respectively, to allow the respective scramblers and descramblers to perform the scrambling and descrambling operations.

9. (Original) The Ethernet-PON according to claim 8, wherein the scrambler for performing the scrambling operation based on the specific function and initial state includes:

a shift register for storing the initial state and performing a shift operation by the subsequent logical operations;

a first exclusive-OR gate for performing an exclusive-OR operation between element values of the shift register, and outputting the resulting value to an input of the shift register;

an AND gate for performing an AND operation between an output of the first exclusive-OR gate and an external enable signal; and

a second exclusive-OR gate for performing an exclusive-OR operation between input data and an output of the AND gate, and outputting the resulting value.

10. (Original) The Ethernet-PON according to claim 9, wherein the specific function is expressed by the following equation:

$$p(x) = c_n X^n + c_{n-1} X^{n-1} + \ldots + c_2 X^2 + c_1 X^1 + 1,$$

where c_i is a constant of '0' or '1', x^i denotes the value of an i-th element of the shift register, and the constant c is set to '1' for elements of the shift register connected to

8

the first exclusive-OR gate, and to '0' for the other elements of the shift register.

11. (Original) The Ethernet-PON according to claim 6, wherein the OLT further includes a multiplexer controller for controlling said multiplexer for receiving the scrambled broadcast/image signals to combine the scrambled broadcast/image signals into the single signal according to a time division multiplexing scheme.

12. (Original) The Ethernet-PON according to claim 11, wherein each of the plurality of ONTs includes:

a second WDM coupler for separating an optical signal received from the OLT into a communication signal of wavelength λ_{DOWN} and a broadcast/image signal of wavelength λ_B;

a second optical receiver for receiving the separated communication signal of wavelength λ_{DOWN}, and converting the signal of wavelength λ_{DOWN} into an electrical signal;

a third optical receiver for receiving the separated broadcast/image signal of wavelength λ_B, and converting into an electrical signal the received signal of wavelength λ_B;

an Ethernet-PON ONT function processor for performing ONT functions;

a third optical transmitter for receiving broadcast/image selection information and a communication signal to be transmitted to the OLT from a corresponding user through the Ethernet-PON ONT function processor, and transmitting said broadcast/image selection information and a communication signal as an optical signal λ_{UP};

9

a broadcast/image channel selector & broadcast/image adapter for selecting a broadcast/image signal according to the broadcast/image selection information selected by the user, and recovering an associated original broadcast/image channel;

a descrambler for descrambling the broadcast/image signal recovered through the channel selector & broadcast/image adapter, and transferring the descrambled, recovered signal to the user; and

a descrambler controller for controlling the descrambler to perform the descrambling operation by transferring the scrambling information corresponding to the ONT from the Ethernet-PON ONT function processor to the descrambler.

13. (Original) The Ethernet-PON according to claim 12, wherein specific functions and initial states are assigned to the ONTs, respectively, to allow the respective scramblers and descramblers to perform the scrambling and descrambling operations.

14. (Original) The Ethernet-PON according to claim 13, wherein the scrambler for performing the scrambling operation based on the specific function and initial state includes:

a shift register for storing the initial state and performing a shift operation by the subsequent logical operations;

a first exclusive-OR gate for performing an exclusive-OR operation between element values of the shift register, and outputting the resulting value to an input of the shift register;

10

an AND gate for performing an AND operation between an output of the first

exclusive-OR gate and an external enable signal; and

a second exclusive-OR gate for performing an exclusive-OR operation between

input data and an output of the AND gate, and outputting the resulting value.

15. (Original) The Ethernet-PON according to claim 6, wherein the OLT further

includes a multiplexer controller for controlling said multiplexer for receiving the

scrambled broadcast/image signals to combine the scrambled broadcast/image signals

into the single signal according to a frequency division multiplexing scheme.

16. (Currently amended) The Ethernet-PON according to claim ~~15~~14, wherein the

specific function is expressed by the following equation:

$$p(x) = c_n X^n + c_{n-1} X^{n-1} + \ldots + c_2 X^2 + c_1 X^1 + 1,$$

where c_i is a constant of '0' or '1', x^i denotes the value of an i-th element of the

shift register, and the constant c is set to '1' for elements of the shift register connected to

the first exclusive-OR gate, and to '0' for the other elements of the shift register.

17. (Currently amended) The Ethernet-PON according to claim ~~16~~15, wherein

each of the plurality of ONTs includes:

a second WDM coupler for separating an optical signal received from the OLT

into a communication signal of wavelength λ_{DOWN} and a broadcast/image signal of

wavelength λ_B;

a second optical receiver for receiving the separated communication signal of

11

wavelength λ_{DOWN}, and converting said signal of wavelength λ_{DOWN} into an electrical signal;

a third optical receiver for receiving the separated broadcast/image signal of λ_B, and converting into an electrical signal said broadcast/image signal of λ_B;

an Ethernet-PON ONT function processor for performing ONT functions;

a third optical transmitter for receiving broadcast/image selection information and a communication signal to be transmitted to the OLT from a corresponding user through the Ethernet-PON ONT function processor, and transmitting as an optical signal λ_{UP} said broadcast/image selection information and a communication signal;

a broadcast/image channel selector & broadcast/image adapter for selecting a broadcast/image signal according to the broadcast/image selection information selected by the user, and recovering an associated original broadcast/image channel;

a descrambler for descrambling the broadcast/image signal recovered through the channel selector & broadcast/image adapter, and transferring the descrambled, recovered signal to the user; and

a descrambler controller for controlling the descrambler to perform the descrambling operation by transferring the scrambling information corresponding to the ONT from the Ethernet-PON ONT function processor to the descrambler.

18. (Original) The Ethernet-PON according to claim 17, wherein specific functions and initial states are assigned to the ONTs, respectively, to allow the respective scramblers and descramblers to perform the scrambling and descrambling operations.

12

19. (Original) The Ethernet-PON according to claim 18, wherein the scrambler for performing the scrambling operation based on the specific function and initial state includes:

a shift register for storing the initial state and performing a shift operation by the subsequent logical operations;

a first exclusive-OR gate for performing an exclusive-OR operation between element values of the shift register, and outputting the resulting value to an input of the shift register;

an AND gate for performing an AND operation between an output of the first exclusive-OR gate and an external enable signal; and

a second exclusive-OR gate for performing an exclusive-OR operation between input data and an output of the AND gate, and outputting the resulting value.

20. (Original) The Ethernet-PON according to claim 19, wherein the specific function is expressed by the following equation:

$$p(x) = c_n X^n + c_{n-1} X^{n-1} + \ldots + c_2 X^2 + c_1 X^1 + 1,$$

where c_i is a constant of '0' or '1', x^i denotes the value of an i-th element of the shift register, the constant c is set to '1' for elements of the shift register connected to the first exclusive-OR gate, and to '0' for the other elements of the shift register.

13